

CLAIMS

- 1 1. A method to clean refractory oxides from a surface of a component comprising
2 metals or metal alloys, including
3 immersing of the surface of the component in a molten salt which dissolves a
4 refractory oxide on said surface; and
5 removing the component from the molten salt with salt adhering to the surface
6 which then rapidly solidifies and acts as a shield to retard re-oxidation of the surface.
- 1 2. The method of claim 1, in which the molten salt comprises a mixture of alkaline
2 hydroxides in a low melting eutectic composition.
- 1 3. The method of claim 2 in which the mixture of alkaline hydroxides includes an
2 essentially pure potassium hydroxide and essentially pure sodium hydroxide, mixed in
3 the proportions of about 59 weight percent potassium hydroxide and about 41 weight
4 percent sodium hydroxide.
- 1 4. The method of claim 1, wherein the metal or metal alloy is characterized by a
2 critical annealing or transition temperature, and in which the molten salt comprises an
3 essentially pure hydroxide with a melting temperature below the critical annealing or
4 transition temperature.
- 1 5. The method of claim 1, wherein the metal or metal alloy is characterized by a
2 critical annealing or transition temperature, and in which the molten salt comprises an
3 essentially pure hydroxide with a melting temperature below the critical annealing or
4 transition temperature, the essentially pure hydroxide being a member of a group
5 including sodium hydroxide, potassium hydroxide, and lithium hydroxide.
- 1 6. The method of claim 2, in which the eutectic composition is comprised of lithium
2 hydroxide and potassium hydroxide, mixed in the proportions of 84 weight percent
3 potassium hydroxide and 16 weight percent lithium hydroxide.

1 7. The method of claim 1, in which the molten salt comprises a low melting mixture
2 of two or more essentially pure hydroxide salts.

1 8. The method of claim 1, in which the molten salt contains dissolved ions of metal
2 more electropositive than the metals or metal alloys of the component.

1 9. A method for manufacturing a device including a component comprising metals
2 or metal alloys, including:

3 immersing of the surface of the component in a molten salt which dissolves a
4 refractory oxide on said surface;

5 removing the component from the molten salt with salt adhering to the surface
6 which then rapidly solidifies and acts as a shield to retard re-oxidation of the surface;

7 heating and applying a solder on the surface of the component, wherein the
8 adhering salt on the surface melts and serves as a flux; and

9 joining the component to another member using the solder.

1 10. The method of claim 9, in which the molten salt comprises a mixture of alkaline
2 hydroxides in a low melting eutectic composition.

1 11. The method of claim 9 in which the mixture of alkaline hydroxides includes an
2 essentially pure potassium hydroxide and essentially pure sodium hydroxide, mixed in
3 the proportions of about 59 weight percent potassium hydroxide and about 41 weight
4 percent sodium hydroxide.

1 12. The method of claim 9, wherein the metal or metal alloy is characterized by a
2 critical annealing or transition temperature, and in which the molten salt comprises an
3 essentially pure hydroxide with a melting temperature below the critical annealing or
4 transition temperature.

- 1 13. The method of claim 9, wherein the metal or metal alloy is characterized by a
2 critical annealing or transition temperature, and in which the molten salt comprises an
3 essentially pure hydroxide with a melting temperature below the critical annealing or
4 transition temperature, the essentially pure hydroxide being a member of a group
5 including sodium hydroxide, potassium hydroxide, and lithium hydroxide.
- 1 14. The method of claim 9, in which the eutectic composition is comprised of lithium
2 hydroxide and potassium hydroxide, mixed in the proportions of 84 weight percent
3 potassium hydroxide and 16 weight percent lithium hydroxide.
- 1 15. The method of claim 9, in which the molten salt comprises a low melting mixture
2 of two or more essentially pure hydroxide salts.
- 1 16. The method of claim 9 in which the solder material comprises essentially pure tin.
- 1 17. The method of claim 9 in which the solder material comprises an alloy nominally
2 comprised of tin and silver, nominally with a range from just over 0 to about 6 weight
3 percent silver.
- 1 18. The method of claim 9 in which the solder material comprises an alloy of gold
2 and tin, nominally 80 weight percent gold, 20 weight percent tin.
- 1 19. The method of claim 9 in which the solder material comprises an alloy in which
2 principal materials comprise lead and tin in various proportions.
- 1 20. The method of claim 9 in which the surface of the component comprises a
2 superelastic or shape memory type nickel-titanium alloy with a composition at or near 50
3 weight percent of each component.

1 21. The method of claim 9 in which the surface of the component comprises a
2 stainless steel or similar alloy whose major constituent is iron together with chromium
3 and nickel in various proportions.

1 22. The method of claim 8 in which a metal more electropositive than the metal of the
2 component is deposited on the surface from a second molten salt containing dissolved
3 ions of said electropositive material.

1 23. A method for manufacturing a device including a component comprising metals
2 or metal alloys, including:

3 immersing of the surface of the component in a first molten salt which acts as a
4 flux to dissolve refractory oxide on said component;

5 removing the component from the first molten salt with salt adhering to the
6 surface which then rapidly solidifies and acts as a shield to retard re-oxidation of the
7 surface; and

8 immersing the component in a second molten salt containing dissolved ions of a
9 metal more electropositive than the metals or metal alloys of the component to obtain a
10 layer of the electropositive metal plated on the surface of the component as a result of
11 electrolytic displacement reaction.

1 24. The method of claim 23 in which the first molten salt comprises a mixture of
2 alkaline hydroxides in a low melting eutectic composition.

1 25. The method of claim 23, wherein the metal or metal alloy component is
2 characterized by a critical annealing or transition temperature, and in which the first
3 molten salt comprises an essentially pure hydroxide with a melting temperature below the
4 critical annealing or transition temperature.

1 26. The method of claim 23 in which the first mixture of alkaline hydroxides includes
2 an essentially pure potassium hydroxide and essentially pure sodium hydroxide, mixed in
3 the proportions of about 59 weight percent potassium hydroxide and about 41 weight
4 percent sodium hydroxide.

1 27. The method of claim 23 in which the first molten salt comprises an essentially
2 pure hydroxide with a melting temperature below the critical annealing or transition
3 temperature, the essentially pure hydroxide being a member of a group including sodium
4 hydroxide, potassium hydroxide, and lithium hydroxide.

1 28. The method of claim 23 in which the first molten salt is a eutectic composition
2 comprised of lithium hydroxide and potassium hydroxide, mixed in the proportions of 84
3 weight percent potassium hydroxide and 16 weight percent lithium hydroxide.

1 29. The method of claim 23 in which the surface of the component comprises a
2 superelastic or shape memory type nickel-titanium alloy with a composition at or near 50
3 weight percent of each component.

1 30. The method of claim 23 in which ions of the electropositive metal are introduced
2 into the second molten salt by dissolving therein compounds of said metal.

1 31. The method of claim 23 in which the second molten salt acting as solvent is a
2 eutectic mixture of sodium hydroxide and potassium hydroxide.

1 32. The method of claim 23 in which the second molten salt acting as solvent is an
2 essentially pure alkaline hydroxide.

1 33. The method of claim 23 in which the second molten salt acting as solvent is a
2 eutectic mixture of lithium hydroxide and potassium hydroxide.

1 34. The method of claim 23, in which the second molten salt comprises a low melting
2 mixture of two or more essentially pure hydroxide salts.

1 35. The method of claim 23 in which the electropositive metal comprises tin.

1 36. The method of claim 23 in which tin-containing ions are introduced into the
2 solvent second molten salt by dissolving a tin compound in said molten salt.

1 37. The method of claim 23 in which tin-containing ions are introduced into the
2 solvent second molten salt by dissolving a tin compound in said molten salt, and wherein
3 the tin compound is tin oxide containing tin in a tetravalent ionic state.

1 38. The method of claim 23 in which tin-containing ions are introduced into the
2 solvent second molten salt by dissolving a tin compound in said molten salt, and wherein
3 the tin compound is tin oxide containing tin in a divalent ionic state.

1 39. The method of claim 23, including soldering the component to another member.